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U-007-305.11

**DISAPPROVAL OF THE TREATABILITY STUDY  
WORK PLAN FOR OU#5**

**01/14/92**

**USEPA/DOE-FO**

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**ENCLOSURE**

**OU5**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

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JAN 14 1992

REPLY TO THE ATTENTION OF:

Mr. Jack R. Craig  
United States Department of Energy  
Feed Materials Production Center  
P.O. Box 398705  
Cincinnati, Ohio 45239-8705

HRE-8J

RE: Disapproval of the  
Treatability Study Work Plan  
for OU #5

Dear Mr. Craig:

The United States Environmental Protection Agency (U.S. EPA) has completed its review of the Treatability Study Work Plan for Operable Unit #5.

U.S. EPA hereby disapproves the Work Plan pending incorporation of the attached comments.

Please contact me at (312/FTS) 886-0992 if you have any questions.

Sincerely,

James A. Saric  
Remedial Project Manager

Enclosure

cc: Graham Mitchell, OEPA-SWDO  
Pat Whitfield, U.S. DOE-HDQ

(fermant)  
action  
response  
to T-0475  
(3713)

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File # 6446.668  
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ATTACHMENT

COMMENTS ON SOIL WASHING TREATABILITY STUDY  
WORK PLAN FOR OPERABLE UNIT 5, DATED NOVEMBER 1991  
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

General Comments

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1. The work plan does not provide any supporting information (either theoretical or experimental) for the experimental design and procedures for the soil washing treatability study. In most cases, it appears as though about ten to fifteen experiments are proposed for each phase of the treatability study without a logical approach to remove target contaminants. For example, to remove primarily uranium from the soil washing extracts, the work plan proposes fifteen different experiments without providing any rationale for the experimental design. It is essential that the revised work plan provide supporting data to demonstrate that the experimental design and procedures are based on a scientific approach.
2. The work plan needs to provide more details on most of the treatability study activities. There are several statements in the work plan which describe the experiments to be conducted in one or two sentences (for example, (1) settling rates will be determined; and (2) biodegradation studies will be carried out). These statements are not adequate either to perform the proposed experiments or to evaluate the usefulness of the data to be generated by these experiments. It should be noted that the experimental procedures should be written in a step-by-step manner with all details included for the experiments to be carried out properly.
3. The work plan does not provide sampling and analytical activities information for all phases of the study. For example, such information specific to the experiments performed in the treatability study is not included in the work plan.
4. Although the work plan states that the quality assurance and quality control (QA/QC) procedures described in the remedial investigation and feasibility study quality assurance project plan will be followed during

the treatability study, it would be helpful if summary tables showing all samples to be collected (including QA/QC samples) during the treatability study are included in the revised work plan. The summary tables would be very helpful to the sampling team and data reviewers.

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### Specific Comments

1. Subsection 1.2.2, pages 4 and 5: This subsection should state in which year the data presented in Figures 1-2 and 1-3 and Table 1-1 were collected. Without this information, it is difficult to judge whether this data can be used to select preliminary sampling locations. This is because in the work plan, Appendix A, page 1, paragraph 1 states that surface water transport might have introduced significant variability in soil contaminant concentrations in a given area over time.
2. Section 3.0, pages 1 to 7: Page 1, line 19 states that the preliminary remediation goals (PRG) presented in Tables 3-1 and 3-2 will be used as target levels for evaluating the effectiveness of the soil washing technology. However, for several compounds, contract required detection limits presented in these tables are higher than the PRGs. For example, the contract required detection limits for (1) arsenic, beryllium, and benzo (a) pyrene in Table 3-1 and (2) actinium-227, protactinium-231, and thorium-228 in Table 3-2 are higher than the PRGs. For this reason, it would not be possible to evaluate whether the PRGs have been met unless the actual detection limits to be achieved are lower than PRGs.
3. Section 3.0, page 2, Table 3-1: The ratio of the soil concentration for meeting the PRG (column 3) to the reference dose (column 2) appears to be constant and equal to 80,000 for all compounds except cadmium, manganese, and mercury. It should be determined if these inconsistencies are errors.

4. Section 3.0, pages 12 and 14, Tables 3-4 and 3-6: Activity 5 in these tables states that chemical extraction effectiveness will be statistically determined. However, neither this section nor Section 8.0 (data analysis and interpretation) presents any information on statistical methods to determine the chemical extraction effectiveness.
5. Section 3.0, pages 13, 15, and 17, Tables 3-5, 3-7, and 3-9: These tables list different constituents of concern for different phases of the treatability study. However, it is unclear why only these constituents are constituents of concern. A rationale for identifying only certain constituents as constituents of concern should be provided (for example, these constituents are (1) difficult to remove from soil using the soil washing technology; (2) present at relatively high concentrations; and/or (3) highly toxic).
6. Subsection 4.2.1, page 3, line 26: According to this line, alkalinity is initially determined for the soils to help determine the quantity of certain extraction reagents necessary to overcome buffering effects and effectively remove contaminants. Alkalinity titration is adequate to identify the buffering effects if the extraction reagents are acidic. However, several alkaline agents are planned to be used during the treatability study (for example, sodium hydroxide and sodium carbonate - see page 4, line 23; and page 8, Table 4-1). For this reason, acidity titration for soils should also be performed to adequately identify the buffering effects.
7. Subsection 4.2.1, page 3, line 32: This line states that the average concentration of eight selected target organic compounds in three samples will be determined during initial sample preparation and analysis of the Remedy Screening - Stage I. However, Table 3-5 (Section 3, page 13) identifies only four target organic compounds instead of eight. This inconsistency should be resolved.
8. Subsection 4.2.2, page 4, line 18: Line 18 states that tap water will be used for soil washing. It is unclear from this sentence what kind of tap water (potable, industrial, or other) will be used. Contaminant-

free water should be used because wash solution is also to be characterized after soil washing. Otherwise, the tap water should be analyzed before soil washing to avoid introduction of an unknown quantity of contaminants in the soil and the soil wash solution.

9. Subsection 4.2.2, page 4, line 22: Line 22 states that five dispersing agents are being considered, and one of these five agents may be added to tap water to deflocculate any soil aggregates. However, the work plan does not identify the criteria to be used in selecting the dispersing agent, or the concentration of dispersing agent. This part of the treatability study is intended to identify contaminants and contaminant concentrations associated with different particle-size fractions of the soil, and the subsequent parts of the study will use that particle-size fraction of the soil determined to be the most contaminated. Because dispersing agents are not proposed to be used in the subsequent stages of this study, it would seem appropriate to carry out this part of the study without using dispersing agents.
10. Subsection 4.2.3, page 6, line 18: According to this line, during chemical extraction using acids, bases, chelants, salts, surfactants, and/or alcohols, if decomposition of extractants occurs because of the elevated extraction temperature (80°C), extraction will be carried out at a lower temperature. However, the work plan does not mention any method to determine whether an extractant has decomposed during the chemical extraction step.
11. Subsection 4.2.3, page 6, lines 24 to 27: Line 24 states that ethylenediaminetetraacetic acid (EDTA) solution will be tested at three different pH values. It is unclear from the work plan why pH is varied only for one of the three chelants used to extract contaminants from soil. It is also unclear why only the surfactants will be tested at different concentrations. Lines 25 to 27 state that additional extractants not mentioned in the work plan may be tested and that some of the extractants listed in the work plan in Table 4-1 may be tested at pH values not noted in the table. These statements suggest that the experiments are not planned based on proper supporting information

(either theoretical or experimental) and several things are left open. Because of this, it is difficult to evaluate the usefulness of the data to be generated from the treatability study.

12. Section 4, page 8, Table 4-1: This table shows that each of the several extractants is tested at only one concentration, but no supporting data is provided to show that these extractants are effective at the proposed concentrations. The work plan should explain the rationale for testing each of the several extractants at only one concentration.
13. Subsection 4.2.4, page 9, lines 6 to 10: The work plan proposes fifteen tests for contaminant removal from washing solutions. Each test consists of adding two reagents in sequential order to the washing solution in order to precipitate metals. The work plan states that these series of reagents have been investigated in earlier studies and have been determined to be effective under selective circumstances. However, the work plan neither cites any references nor provides any theory to support this experimental design. Without such information, it is difficult to evaluate the usefulness of the proposed tests. It should be noted that significant published work is available on the removal of radionuclides from water, and such work can definitely be used in experimental design (for example, see Sorg, T., "Methods for Removing Uranium from Drinking Water," Journal of American Water Works Association, July, 1988). Also, it is unclear why this subsection does not discuss organic contaminant removal from washing solution.
14. Subsection 4.2.4.1, page 9, lines 12 to 30: This subsection proposes to use 3 to 5 milliliters (ml) of soil washing solution to perform precipitation tests. In each of the fifteen tests proposed, two reagents will be added in sequence to the washing solution. The first reagent is allowed to react before the second reagent is added. The work plan states that the most promising reagent combinations will be determined by professional judgement. During each test (1) onset of turbidity and precipitation along with pH changes and (2) the solids settling rate will be recorded. At the end of each test, the solution will be filtered and uranium concentration will be measured in the

filtrate. The concerns associated with this experimental design are listed below.

- (a) Several details regarding the experimental design are missing. The work plan does not specify the volume of the first reagent added or the criterion used to stop the addition of the first reagent and begin the addition of the second reagent. Line 21 states that the first reagent is added and allowed to react, but does not state for how long it will be allowed to react. Similarly, the work plan does not specify a criterion to end a test. Noting the appearance of turbidity does not allow a good professional judgment regarding uranium precipitation because turbidity may result from the precipitation of other metals present in washing solution, or the addition of some of the reagents (for example, magnesium oxide and calcium hydroxide) in slurry form.
  - (b) This subsection does not give the concentrations of the reagents used. It is important to specify the concentration of reagents because only 3 to 5 ml of washing solution is to be used in each test. If very small quantities of concentrated reagents are to be added, the volume of the reaction mixture (washing solution plus reagents) may be too small to measure pH or the solids settling rate. If large quantities of dilute reagents are to be added, contaminant concentrations in the reaction mixture will be lowered simply due to dilution.
  - (c) Lines 18 and 19 state that to improve filtration or settling characteristics, polymers and filter aids may be used. The work plan should identify what types of polymers and filter aids will be used and what experiments will be done to determine their doses.
15. Subsection 4.3.2, page 12, lines 24 to 26: According to these lines, in Remedy Screening Stage II, the effect of extractant to soil dose ratio (dose rates) will be studied at 2:1 and 4:1. It is unclear why these two dose rates differ from the dose rate (10:1 -- see page 8, Table 4-1) planned to be used in the Stage I. The revised work plan should justify why the dose rate used in the preliminary study (Stage I) is not used as one of the two doses in the subsequent parts of the study (Stage II).
16. Subsection 4.3.3, pages 16 to 18: This subsection lacks detail in several areas. Some examples of such areas are described below.

- (a) The work plan (for example, see subsection 4.3.3.1) should clearly describe the type of reactor used and type of mixing provided, concentrations of reagents used, contact time provided, and several other details necessary to carry out precipitation experiments. Similarly, statements such as (1) "settling rates will be determined," and (2) "aliquots of these mixtures will be filtered or centrifuged," do not give any idea about what type of data will be collected and how useful the data will be. The experimental procedures should contain details necessary to carry out the experiments properly.
- (b) Line 17 states that if settling or filtration rates are very slow, jar tests will be conducted using inorganic coagulants and/or organic polymers. The work plan should specify the range of settling and filtration rates that will be considered very slow.
- (c) Subsection 4.3.3.4 should explain the purpose of the kinetic experiments and how the data from these experiments will be used. Line 5 of this subsection states that column experiments will be conducted and 600 ml of liquid will be treated. Again, more details on the size of the column, empty bed volume, and contact time should be provided for the column experiments. It is unclear why a minimum of 600 ml will be treated. The work plan should explain whether breakthrough is expected after treating 600 ml, and how the breakthrough will be monitored.
17. Section 4.3.4, page 18: This subsection makes a reference to the use of bioremediation technology to remove any excessive organic residuals present in the treated soil after soil washing. Other than stating that a slurry batch reactor will be used, the subsection does not provide any details about the technology or the experimental procedure. These details should be included in the revised work plan.
18. Section 6.0: This section provides soil sampling methods for different locations of the production area at the Fernald site in Ohio, and methods for soil sample analysis. However, this section does not provide any information on sampling and analytical methods specific to treatability activities for solids and liquids. The revised work plan should include the missing information for all activities described in Section 4.0.
19. Subsection 6.4, page 8, lines 3 to 8: The work plan states that each sampling location will be first staked out, a grid of the area will be laid out, and six discrete soil samples will be collected from each

area. This subsection should also mention how the six discrete sampling points will be determined (for example, by generating six random numbers for the nodes or by some other approach).

20. Section 6.0, page 9, Table 6-3: This table should (1) cite an analytical method for the RAD screen, (2) state the holding time for mercury (one of the HSL metals) as 28 days, (3) correctly cite the analytical method for total organic carbon measurement in soil (the method cited is for liquids), and (4) include relevant information for mineralogy (one of the analytical parameters listed in the table).
21. Section 8.0: This section should be expanded to include information on how the data will be evaluated and interpreted in conformance with the treatability study objectives as applied to each phase of the study. Appropriate equations should be given wherever applicable, and a brief description of how these equations will be used to analyze the data should also be included.

U.S. Department of Energy  
Fernald Environmental Management Project

Soil Washing Treatability Study Work Plan  
for Operable Unit 5

Remedial Investigation and Feasibility Study  
Dated November 1991

Comments by  
U.S. Environmental Protection Agency  
Region V, Radiation Section

GENERAL COMMENTS

Uranium as Screening Agent: It may be appropriate to use uranium as a screening agent given that it has been found whenever other radiological contaminants have been detected. However, there are a number of concerns that must be addressed in order to ensure that hazards other than uranium are not being neglected:

1. If uranium is used as a screening agent, calculations should be made to establish a relationship between hazards from uranium and those due to other contaminants. Preliminary calculations based on measured soil concentrations indicate that doses from contaminants other than uranium — such as actinium decay series products — may contribute more than twice as much inhalation dose as uranium does. Therefore, it is crucial that if uranium is used as a screening contaminant in soil testing, there must be some means of accounting for hazards from other radionuclides. Otherwise, analysis for specific radionuclides besides uranium should be undertaken throughout all stages of the treatability study.
2. Even if uranium is used for screening purposes, the removal from soil of other radionuclides must be considered when a treatment option for Operable Unit 5 (OU5) is being chosen. Testing for some transuranics, as well as a number of other radionuclides (such as Cs-137, Ra-226, Sr-90, Tc-99, etc.), has been incorporated into the treatment selection step of the work plan. However, a number of inconsistencies in the plan make it questionable whether all contaminants of concern will be adequately addressed. There are a number of steps necessary to ensure that adequate control will be exerted. First, all contaminants of concern must be identified in the initial soil characterization, and baseline levels of contamination established. Second, contaminants found during initial characterization need to be followed throughout the treatability study. Monitoring of various media in the study material must be done since it is unclear how the treatment process may concentrate specific radionuclides. Lastly, final contamination levels need to be established. These levels should be compared to preliminary (or final) remediation goals (PRGs). Such a comparison needs to be part of the decision-making process for choosing the treatment option for OU5. As stated earlier, this is crucial because the residual risk at

the site depends on the cleanup levels of a variety of radionuclides and not on uranium only.

To this end, three lists must be reconciled so that they are entirely consistent: Table 6-1 (Initial Characterization), Table 3-9 (Remedy Selection Testing), and Table 3-2 (Preliminary Remediation Goals). Those contaminants for which PRGs are identified are obviously considered important since preliminary goals have been developed for them. Therefore, each of the radionuclides in Table 3-2 should be included in the initial characterization and so that it can be tracked throughout the study if need be. All contaminants of concern found should also be added to the list of contaminants to be analyzed in treatment selection. For example, Ac-227 and Pa-231 (among others) appear in Table 3-2 with PRGs identified, but are not included in Tables 3-9 and 6-1. It is important that specific isotopes also be identified and followed since PRGs differ for each. Final levels will obviously be compared to the list of PRGs.

**Monitoring for Alpha and Beta:** It is unclear what significance measurements for gross alpha and beta in soil samples will have (see Tables 3-5 and 3-7, for example). This is especially true given that self-absorption for alpha is likely with soil. Standards for alpha and beta usually apply to water and even then are based on assumed relationships between specific radionuclides. The use of monitoring for gross alpha and beta should be justified. In addition, it should be indicated what relationship exists between these measurements and actual (or estimated) levels of contaminants of concern. Any assumptions made should be stated.

**Leachate Disposal:** The definition of "leachate" in this document should be expanded and articulated so that it clearly includes rinsate, filtrate, and washing waters generated during the treatability testing. Otherwise, disposal procedures for these liquids may not be immediately apparent. Also, the means of disposal for these wastes should be outlined and applicable or relevant and appropriate requirements (ARARs) identified. For instance, are these liquids to be discharged to nearby waterways?

**Cleanup Goals:** Preliminary remediation goals (PRGs) identified in Section 3.0, Test and Data Quality Objectives, need to be integrated with the rest of the work plan. For example, they should appear in the flow sheets showing experimental processes so that they are utilized in the evaluation of the treatments. Contaminants for which PRGs are specified should also be monitored in initial characterization and followed throughout the testing in order that the removal effectiveness can be evaluated (see comment above on uranium as screening agent). Cleanup levels should be risk-based. All action levels given which are not risk-based, or are not clearly risk based -- such as the 35 pCi/g limit used -- should be justified.

The 35 pCi/g limit in particular must be examined. This limit seems to focus primarily on uranium concentrations without leaving room for risk contributions from other radionuclides. It must not be used as a cleanup goal unless the total risk does not exceed  $10^{-4}$ . Calculations using measured contaminant concentrations (Table 1-1) in OU5 show that the goal of  $10^{-4}$

residual risk may be exceeded for the total number of radionuclides identified if 35 pCi/g is used as a cleanup level. The use of the rule of ratios may be a more appropriate method of determining an action level.

**Health and Safety Plans:** The health and safety plans need to be more specific with regards to radiological monitoring and action levels. Both the instrumentation to be used and the frequency of monitoring should be stated for all monitoring. The sources of action levels should be referenced, and their use justified. The specific actions to be taken when action levels are exceeded should also be stated. Personal protection equipment levels should be triggered by definite action levels for radionuclides or radioactivity just as they are for chemical contaminants.

#### SPECIFIC COMMENTS

**Section 1.2.2, p. 1-4** -- The significance of dividing contaminated areas according to whether they are above or below 35 pCi/g is unclear. Clarification should be given as to why 35 pCi/g is used as division for delineating areas of contamination. This is not specified as either an action level or cleanup goal, but is cited several times throughout the document.

**Section 1.3.3, p. 1-15, paragraph 5** -- The ARARs to be used should be identified in the document since residuals will be produced in testing and must be disposed of regardless of whether a treatability option is selected.

Cleanup levels have yet to be established; however, PRGs based on risk are identified. These must be cross-referenced in this document and integrated more closely with the work plan.

**Section 1.3.3, p. 1-15, paragraph 6** -- The levels of residual risk, after cleanup, which will be considered acceptable, must be specified.

**Section 3.0, p. 3-1, paragraph 3** -- The targets are not effectively integrated into the work plan, particularly the decision-making process that determines which treatments advance to the next stage of testing. For example, a comparison with the PRGs must be specified in the experiment design flow sheets.

**Section 3.1, p. 3-1, paragraph 3** -- Although it may be true that a treatability option should not be eliminated on the basis of failing to achieve an individual remediation goal, it is certainly relevant to specify that any treatment accepted must a) meet or exceed cleanup levels for specific contaminants (such as uranium), and b) must meet limits on the TOTAL residual risk remaining at the site if that treatment option is utilized. (Again, such a limit on the acceptable risk is not included in the current version of this document, but should be added.) Both of the above criteria should be clearly outlined as necessary for acceptance of a soil washing treatment scheme.

Section 3.1, p. 3-1, paragraph 4 — All contaminants included in the preliminary soil characterization should have PRGs specified. It is impossible to determine the effectiveness of contaminant removal if initial levels are unknown.

More importantly, it seems that contaminants have had PRGs identified because they are hazards of concern and should therefore be followed throughout the cleanup process. Therefore, they MUST be included in the initial soil characterization since only those contaminants found during initial characterization will be targeted for cleanup.

Table 3-2, pp. 3-7,8 — Again, the radionuclides for which PRGs are identified are inconsistent with the targeted contaminants analyzed during the initial soil characterization (see Tables 3-9 and 6-1). Radionuclides included in the characterization should have PRGs specified. Likewise, radionuclides considered important enough to have PRGs should be included in the initial characterization so that they can be traced throughout the treatment process if need be. Otherwise, such inconsistencies may give the impression that there is indefinite commitment to the use of risk-based cleanup levels, or to the use of any cleanup goals (since these are the only goals identified), in the selection of cleanup technology.

Table 3-4, p. 3-12 — It would be useful to have the detection limits spelled out in this work plan, if only by the use of an appendix copied from the QAPP. This applies also to Tables 3-6 and 3-8.

Table 3-8, p. 3-16 — The use of the term remedial action objectives (RAOs) for levels of concern may lead to confusion since the goals identified in this document are PRGs. Levels of targeted contaminants should be referenced to the preliminary remediation goals (PRGs) or to final cleanup goals (once identified).

Table 3-9, p. 3-17 — Again, there are inconsistencies between this list of contaminants and those that are targeted and followed according to the initial characterization. These inconsistencies should be resolved.

Section 4.2.4.1, p. 4-9, paragraph 3 — Filtrate should be analyzed for gross alpha and beta (if deemed appropriate) in addition to uranium so that analysis is consistent. In addition, the suspended solids collected on the filter should be analyzed for uranium (and for gross alpha and beta if deemed appropriate), both because the solid must also be disposed of (whether in solution or filtered out) and because the radioactivity measurements may be useful in a mass balance to assure that all contaminants have been accounted for.

Figure 4-4, p. 4-10 — Figure should be amended so that analysis of solid collected on filter is included.

Figure 4-5, p. 4-14 — Figure should be amended so that analysis for uranium is also specified in the last step.

Section 4.3.3.2, p. 4-16, paragraph 4 -- Solids collected should be tested for uranium and gross alpha and beta (if justified). Similar guidelines for analysis apply to all measures used to purify treatment solutions, including settling and settling with filter aids.

Figure 4-6, p. 4-17 -- Analysis of filter solids should be included in this flow chart.

Section 4.4.1, p. 4-18, paragraph 4 -- The last sentence should be amended to read, "Before the soil is processed, it will be homogenized as described in Section 4.1.1, and analyzed for organics, inorganics, and radionuclides in accordance with Tables 3.1 and 3.2."

Figure 4-7, pp. 20-21 -- Analysis and comparison with cleanup goals should be incorporated into the process description and flow sheet.

Section 4.4.2, p. 4-21, paragraph 5 -- The first sentence should be amended to read, "The radioactive constituents found during initial characterization and identified in Table 3-2 will be analyzed in the extracted soils, extractant solutions, and wash water."

Section 4.5, bullet 1 -- Complete soil characterization includes radionuclide analysis of contaminants identified in Table 3-2, as well as gross alpha and beta if such measurements are justified for soils.

Section 6.1, p. 6-1, paragraph 4 -- The ARARs and exposure limitations should be specified here to facilitate determination of the constraints.

Section 6.2, p. 6-4, paragraph 1 -- It is not clear that an alpha-beta frisker is the appropriate instrument to be used for soil monitoring. Information critical to this determination should be provided, including instrument type, monitoring methodology, and required sensitivity. It should be shown that the required detection limits will be met or exceeded.

Section 6.2, p. 6-4, paragraph 2 -- Further justification must be provided for the use of 35 pCi/g as an action level. The various levels of contamination in OU5 -- ranging from depleted uranium to slightly enriched -- may make it an inappropriate guideline for all uranium isotopes and mixtures of uranium isotopes. Any assumptions made in the use of this number as an action level should be stated. In addition, it is unclear how the 35 pCi/g action level relates to the risk-based remediation goals levels given in Section 3 (see general comments on Cleanup Goals). Clarification on this point should be provided.

Table 6-1, p. 6-5 -- Inconsistencies between this table and Tables 3-2 and 3-8 should be resolved so that all contaminants of concern are addressed. Each contaminant for which a PRG has been developed should be included in the initial characterization and followed through the treatment process (including Treatment Selection analysis and comparison with cleanup goals) to determine its fate.

Section 6.4, p. 6-6, paragraph 4 — The second sentence should be amended to read, "Two of the four locations will be selected based on high levels of uranium ( $>200 \mu\text{g/g}$ ) . . ."

Section 6.4, p. 6-8, paragraph 2 — The type, method of utilization, and sensitivity of the beta-gamma frisker must be provided in order to determine if it is an appropriate instrument to be used for mapping radioactivity levels. Minimum required sensitivity should be identified, and it should be verified that such sensitivity levels can be met.

Section 6.5, p. 6-8, paragraph 5 — Again, more detailed information on the detector must be provided in order to document that it is an appropriate instrument for mapping radioactivity levels in soil.

Table 6-3, p. 6-9 — No specific analytical method has been specified for radiological analysis. At a minimum, an internal standard operating procedure (SOP) or source of quality assurance/quality control (QA/QC) requirements and minimum detection limits should be identified in the table.

Section 10.2, p. 10-1, paragraph 4 — Under this study, the leachate produced includes not only those from the modified toxicity characteristics leaching procedure (MTCCLP) and toxicity characteristics leaching procedure (TCLP), but also all washing, filtering and rinsing solutions. All such solutions must undergo characterization and comply with all applicable guidelines for packaging and disposal. This section should be amended to reflect the broader definition of leachate as it applies to this site.

References — The QAPP cited in the treatability study should be included in the list of references. Since there are several versions available currently, it is necessary to provide detailed information so that the correct document can be identified.

Section A.1.0, p. A-1, paragraph 1 — Detection limits should be specified, either in this paragraph or on the site maps where uranium concentrations are mapped out.

Section A.1.0, p. A-2, paragraph 2 — It is stated that both thorium and radium were found in soils. Details should be given on which specific isotopes are present. For what other radionuclides was analysis performed? Data in the tables of this Appendix concerning radionuclide testing is sparse. All analysis for specific radionuclides (including individual isotopes) which was performed should be specified, and any negative or positive results reported also, so that the extent of previous characterization of soils is clear.

Section C.5.1, p. C-7, paragraph 1 — Although short-lived decay products are identified as radiation hazards in addition to uranium, there is no monitoring to assess their concentrations in air. This deficiency must be addressed. Specifically, the hazards from radon and its associated decay products must be accounted for. Since radon is easily measured, such measurements should be taken. Alternatively, environmental data documenting levels of radon may be presented and used to assess health hazards.

Section C.5.2, p. C-7, paragraph 3 — The analytical equipment to be used and a summary of analysis to be performed on the filter samples should be summarized here for clarification of the sampling method although it is included elsewhere in a SOP. At a minimum, the type of detector used for counting and its sensitivity should be presented.

Also, the flow rates of a portable air pump (BZA) and a high volume air sample pump are vastly different. The duration of sampling (and the sampling interval) should be determined for each instrument based on the ability to detect contaminants at action levels.

Section C.5.3, p. C-7, paragraph 5 — Instruments to be used for monitoring sample locations must be specified (including information such as instrument manufacturer, model, sensitivity, etc.); it is unclear from the description whether such monitoring will be able to provide accurate or appropriate information about the radiological hazards existing at the worksite.

Minimum requirements for periodic radiation monitoring at sample locations should be specified so that changing hazard conditions related to soil removal, dust generation, and changing soil profiles and contamination with depth are detected. Time intervals between sampling should be more specific than "periodically." Sampling duration and intervals should be based on minimum required detection limits.

Section C.6.0, P. C-10, paragraph 3 — Protective clothing requirements should be formalized so that specific levels of contamination or radioactivity at a sampling site automatically necessitates a given level of protective clothing. Such limits have been identified for non-radiological chemical contaminants and should be for radiological hazards as well. A number of measures could be used as an action level, including activity or a percentage of the Derived Air Concentration (DAC); however, the decision to choose a specific measure must be justified, and the applicable action level clearly stated. More conservative judgements would of course be allowed in the field according to the professional judgement of the field team supervisor.

Section C.7.0, p. C-13, paragraph 5 — The support zone must be clearly marked as a clean area to emphasize the importance of avoiding any cross-contamination from the controlled zones.

Section C.7.0, p. C-13, paragraph 6 — Adequate justification is not provided for abandoning the site control program described. The basis for the assumption that significant contamination will not occur must be explained.

Section C.8.0, p. C-14, paragraph 5 — There is no "Section 5.2.5," either in this appendix or in the main body of this document. The required levels of respiratory protection must be clearly stated, accessible, and correctly cross-referenced.

Section C.8.2.1, p. C-16, paragraph 4 — Monthly bioassays are inadequate for characterizing doses from uranium, as such sparse testing may result in significant missed dose. Urinalysis samples should be submitted at least weekly.

Section C.9.0, p. C-19, bullets 7 and 8 — The level of monitoring must be detailed, including the specifications of the instrumentation, particularly sensitivity and detection limits.

Section C.10.2, p. C-20, paragraph 5 — It should be specified where decontamination is to take place. Again, there was inadequate justification presented for abandoning the three-zone control system, which is a useful delineation both for personnel monitoring when leaving a controlled area and for providing a more controlled area where decontamination may be undertaken.

Table C.3-2, p. C-28 — Justification is needed for the choice of action levels. In addition, it is unclear what action is to be taken when the action level is exceeded. For instance, is work to be stopped and the work area cleared while the health physics (HP) review takes place?

Table C.3-4, p. C-30 — Personal protection equipment (PPE) action levels must be provided also for radionuclides in terms of air concentrations or activity levels to ensure that exposure to radionuclides is not excessive. Specified protection levels, as with chemical contaminants, must be automatically triggered by certain levels of radiological contaminants. Of course, PPE levels could be upgraded in the field if the field team supervisor so directs.

Section D.4.1, p. D-4, paragraph 2 — What action is triggered by this action level, and how are these requirements integrated into the rest of this safety plan? There is little evidence that this action level is carried through the remainder of the plan. How is this action level related to the action levels presented in Section D.5.2.1?

Short-lived decay products have been identified as a hazard in previous parts of this document. However, they are neglected here. Justification for excluding these hazards from the safety plan and for omitting action levels for them should be presented.

Section D.5.2, p. D-6, paragraph 3 — The frequency of monitoring, or the minimum requirements (at least hourly, for example) should be clearly stated.

Section D.5.2.1, p. D-6, paragraph 4 — The source of these action levels should be referenced. In addition, the specific actions to be taken when the action levels are exceeded should be outlined. For instance, is work to be suspended while an HP review takes place and mitigation measures are undertaken? Should workers don respirators?